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ABSTRACT

In an effort to improve the reliability of the Noncognitive Questionnaire (NCQ), the instrument was revised and the revision's reliability and validity were examined examined with black and white college freshmen. The NCQ measures eight non-traditional or non-cognitive variables that relate to minority student retention. The revised NCQ is composed of 67 items; 38 Likert type items were added to the NCQ to create the revised form. Initially, the fit of the revised NCQ to eight hypothesized constructs was examined using confirmatory factor analysis on a sample of 101 black students. It was found that the revised instrument adequately represented the data. Tests of the invariance of the factor structure obtained on the initial black samples compared to a second black sample of 97 students and a sample of 202 white students revealed that the factor structure held across samples. It was concluded that the revised instrument was content valid and that the scales were stable and invariant across race. Five data tables are presented. (TJH)

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Summary

The predictive validity of the Non-Cognitive Questinnaire (Tracey & Sedlacek, 1984) has been demonstrated in past research, however some of the scales of this instrument have been found to have relatively low reliabilities. In an effort to improve measurement, the NCQ was revised and the reliability and validity examined on black and white samples of college entrants. First the fit of the revised NCQ to the eight hypothesized constructs was examined using confirmatory factor analysis on a sample of 101 black students. It was found that the revised instrument adequately represented the data. Tests of the invariance of the factor structure obtained on the initial black sample to a second black sample (N=97) and a white sample (N=202) revealed that the factor structure held across samples. It was concluded that the NCQ-R was content valid and that the scales were stable and invariant across race.

Factor Structure of the Non-Cognitive Questionnaire-Revised Across Samples of Black and White College Students

There is a growing awareness that academic success is a function of more than just academic ability. It has been demonstrated that other less "intellectual" dimensions are as or more important in accounting for academic success in higher education (Pantages & Creedon, 1978). Much of this research supports Tinto's (1975) contention that the academic and social integration into the institution are key determinants of academic success, especially persistence (Aitken, 1982; Bean, 1980; Munro, 1981; Pascarella & Chapman, 1983).

Although there is evidence that noncognitive dimensions are important determinants of academic success for all students (Astin, 1975; Messick, 1979; Nelson, Scott, & Bryan, 1984; Stoecker, Pascarella, & Wolfle, 1988), these less traditional measures appear to be especially important predictors of minority academic success in higher education (Astin, 1982; Fleming, 1984; Nettles, Thoeny, & Gosman, 1986; Sedlacek, 1988; Wolfle, 1985). Reviewing the research in this area, Sedlacek and Brooks (1976) posited eight noncognitive dimensions that were important in minority student academic success. These eight dimensions were: positive self-concept, realistic self-appraisal, understanding of and and ability to deal with racism, preference for long range

goals over more immediate short-term needs, support of others for academic plans, successful leadership experience, demonstrated community service, and academic interest and familiarity.

To assess these eight dimensions, Tracey and Sedlacek (1984), developed the Non-Cognitive Questionnaire (NCQ). It has been shown in subsequent research that the NCQ was: (a) content valid, i.e., that the instrument items loaded on the hypothesized general dimensions (Tracey & Sedlacek, 1984), (b) predictive of grades over four years for both black and white students (Tracey & Sedlacek, 1984, 1985), (c) highly predictive of persistence especially for black students above that obtained using academic aptitude measures (Tracey & Sedlacek, 1985), (d) highly predictive of eventual graduation, especially for black students (Tracey & Sedlacek, 1987a), (e) predictive of persistence for specially admitted students (White & Sedlacek, 1986), and predictive of grades and persistence for international students (Boyer & Sedlacek, 1988). However Tracey and Sedlacek (1987b) found that some of the scales were not as strong psychometricly as desired. Specifically some of the internal consistency estimates were low.

The purpose of this study was to refine the instrument such that some of the subscales would more reliably and accurately reflect the desired construct. To this end the number of items was increased. The reliability and validity of this revision was

examined through the application of confirmatory factor analysis. Specifically the fit of this revision to the proposed eight dimension model was examined. In order to further support the revision the invariance of the factor structure of the Non-Cognitive Questionnaire-Revised (NCQ-R) across racial groups.

Method

Sample

A sample of new freshmen students attending summer orientation at a large, eastern, state university were given the NCQ-R during the summer of 1987. Summer orientation is attended by more than 90% of the new freshmen each year.

Students attending summer orientation typically are required to fill out several instruments in a group assessment. The specific groups of students that were given the NCQ-R were randomly selected. NCQ-R instruments were completed by a total of 1633 students. This group contained 198 blacks, 1269 whites and 166 students of other ethnic/cultural background, or those who did not identify themselves. Only the black and white samples were examined.

Instruments

Non-Cognitive Questionnaire-Revised (NCQ-R) is an extended version of the Non-Cognitive Questionnaire (Tracey & Sedlacek, 1984). The NCQ-R is composed of 67 items and is identical to the NCQ except 38 more Likert type items were added to gain a better assessment of the eight noncognitive dimensions proposed by Sedlacek and Brooks (1976) to be related to minority academic success in higher education. The NCQ-R is composed of 58 statements pertaining to perceptions and expectations of one's academic career (responded to using a 5 point Likert type format, 1=strongly agree, 5=strongly disagree), two items concerning the amount of education expected, three items requesting that the student list current goals, accomplishments, and outside activities, and several background items (gender, sex, race, and age). The 67 items comprised two sets, one set which was designed to directly reflect the noncognitive dimensions (38 items) and a second set of experimental items. The first set of items, i.e. those directly relating to the eight noncognitive dimensions were examined in this study. Each of the eight dimensions was represented by 3 to 7 items.

Analysis

This study was designed to assess the validity of the factor structure of the NCQ-R. Specifically, the validity of the eight

subscale structure of the NCQ-R was examined using Confirmatory Factor Analysis (CFA) on the item covariance matrix through the LISREL VI (Joreskog & Sorbom, 1986) package. Since the factor structure of the NCQ-R had yet to be established, it was initially appropriate to estimate the loadings of this instrument. Since primary interest was in the validity of the instrument with minority students, the black sample was the one where this initial estimation was examined. Given that 38 separate items were included on the subscales and to reduce computer costs which can be high using LISREL on a data set of this size, items were summed to create two or three item subscales. A listing of the items included in subscales is presented in Table 1. These 24 subscales were then used as the indicator variables of the eight noncognitive dimensions.

Insert Table 1 About Here

However, the factor loadings obtained in one sample may not reflect those obtained in another because of the inclusion of sample idiosyncratic covariance. So it was important to obtain an independent estimate of the validity of these factor loading estimates on another sample of black students. This was done by randomly splitting the black sample into two subsamples, one for parameter estimation and the second to test the generalizability

of these parameters. The analysis in this study consisted of three steps. First, half of the black sample (N=101) was used to estimate the factor loading parameters. Then the invariance of these parameters in the second black sample (N=97) was examined. Finally, the invariance of these parameter estimates across race was examined by testing the model derived on the first black sample on a random sample of the white students (N=222).

Results

Prior to all analyses, the internal consistency of each of the eight dimensions was estimated for each of the three samples. These reliability estimates are listed in Table 2. This enabled an initial check on the appropriateness of using smaller 2 and 3 item subscales instead of individual items in the subsequent CFA.

Insert Table 2 About Here

The test of the fit of the proposed factor structure to the first black student sample was found to be adequate. Although the maximum likelihood goodness of fit chi-square was significant (χ^2 (N=101,181)=250.24, p<.001), the chi-square/degrees of freedom ratio (1.38) was well within good fit range. Marsh and Hocevar

(1985) suggest chi-square/degrees of freedom ratios below two are indicative of adequate fit. Further indications of a good fit were the GFI (goodness of fit index) of .83, a root mean square residual of .042, a modification index matrix of uniformly low values (six values greater than 5.0) and a normalized residual matrix with values below 2.0. The Tucker-Lewis Index (TLI, Tucker & Lewis, 1973) was also calculated because Marsh, Balla, and McDonald (1988) have found that this is one of the few indices of fit that is independent of sample size. The TLI for this model on the black sample was .85. The resulting standardized parameter estimates of the factor loadings (Lambda X) were all found to be significant (ratio of parameter estimate to the standard error was greater than 2.0) and are presented in Table 3. The standardized parameter estimates of the relations among the eight dimensions (phi matrix) are presented in Table 4.

Insert Table 3 About Here

Insert Table 4 About Here

The invariance of this model was examined with respect to the second black sample and a sample of white students. This invariance was examined in a sequential stepwise process. First,

the equality of item covariance matrices was examined. The tests of this equality are presented in Table 5.

Insert Table 5 About Here

Although the chi-squared statistic of the equal covariance between the first and second black samples was significant, the chi-square/degrees of freedom ratio of 1.96 was below 2.0. This result led us to conclude that the covariance matrices were not different. This conclusion was further supported by the relatively good fit indicators obtained when the model derived on the first black sample was applied to the second black sample (see Table 5).

The examination of the equality of the covariance matrices of the original black student sample with the sample of white students also yielded similar results. Although the chi-square result was significant (X^2 (N=323,253)=384.37, $p<.001$), the chi-squared/degrees of freedom ratio was below 2.0, and the fit of the black model to the white data was generally adequate.

Discussion

Overall, the results are supportive of the validity of the NCQ-R measuring the eight noncognitive dimensions posited by

Sedlacek and Brooks (1976). The confirmatory factor analysis on the first black sample demonstrated that the eight factors represented an adequate fit of the data. Given that the NCQ-R contains many of the same items as the original NCQ, there is every reason to view this version as an improvement. Instead of the one to three items per scale of the original, the revised version has from three to eight items per dimension. Further, the internal consistency of the scales is much improved over the original version. On the original black sample, the estimated alphas for each subscale ranged from .55 to .84 (with the mean being .66). Though these estimates of internal consistency could be higher, they appear adequate given the difficulty in defining the constructs of interest.

An examination of the internal consistency estimates across the three samples studied revealed a similar pattern overall. In general, the reliability for each subscale was equal across the three samples, however there were some important differences on specific subscales. The white and the second black samples had somewhat lower reliability estimates on the academic self-concept and the support for academic plans subscales. These two subscales were also those with the fewest number of items, so it would be expected that the internal consistency would vary most on these. Perhaps the most interesting differential result on the internal consistency across the three samples was the lower value obtained

for the white sample on the racism subscale. This makes intuitive sense given that this dimension should be less salient for whites it is for blacks. Items reflecting interacting with other cultures and relative comfort level in a predominately white university are measuring different dimensions for white students. For blacks these items are assessing more of the same dimension. Thus the validity of this one scale for whites is questionable, although it is likely that those items that concern "negotiating the system" are valid for all students.

An examination of the correlations among the eight constructs reveals that there is a fair amount of overlap especially involving the constructs of racism and realistic self-appraisal. This communality could be somewhat attributable to the difficulty in defining these constructs. But, in addition this could be due to the importance of each of these in relation to the other six noncognitive dimensions. There may be a higher-order construct accounting for these relations. Or perhaps these dimensions of racism and realistic self-appraisal are the crucial aspects that are being assessed in the NCQ-R. It was demonstrated in predictive validity studies of the original NCQ (Tracey & Sedlacek, 1984, 1985, 1987a, 1987b) that these two dimensions were especially important in predicting academic success for black students.

Finally, there was adequate support found for the invariance of

the factor structure of the NCQ-R across samples of black students as well as across race. The validation sample of blacks were found to respond to the NCQ-R in a similar manner as the original black sample. The white sample was also found to have a similar response pattern as the black sample. So the Non-Cognitive Questionnaire- Revised has been found to have adequate support for application with white and black students.

There are several next steps that are required in the development and application of the instrument. Certainly, the validity of the instrument needs to be examined at other institutions. Though the support for it is good with these samples examined here, they were all generated at one university. More examination of the generalizability of the factor structure is required. Also, though the original NCQ has been found to have good predictive validity, especially with respect to black student persistence and eventual graduation (Tracey & Sedlacek, 1985, 1987a), the predictive validity of the revision needs examination. However, given that many of the same items form part of the subscales in the NCQ-R, it is expected that there would be equally high predictive validity for the NCQ-R.

Given the very different pattern of academic success between black and white students and the very different entry and attrition rates (Astin, 1982; Sedlacek & Pelham, 1976; Sedlacek &

Webster, 1978) it is important that attempts be made to determine the dimensions related to these differences and ameliorate them. The eight dimensions proposed by Sedlacek and Brooks are a start in this area. The NCQ-R appears to be a useful instrument to examine student success in higher education.

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Table 1

Items Included on Each of the Eight Noncognitive Dimensions and the Separate Indicator Subscales.

Item	Indicator Subscale
Academic Positive Self-Concept (PSC)	
My high school grades don't really reflect what I can do.	PSC1
I expect to have a harder time than most students here.	PSC1
It should not be very hard to get a B average here.	PSC2
I am as skilled academically as the average applicant here.	PSC2
Realistic Self Appraisal (RSA)	
I know the areas where I am weak and I try to improve them.	RSA1
I want a chance to prove myself academically.	RSA1
If tutoring is made available on campus at no cost, I would attend regularly.	RSA2
When I believe strongly on something I act on it.	RSA3
I try to find opportunities to learn new things.	RSA3
Support of Academic Plans (SUP)	
My friends and relatives don't feel I should go to college.*	SUP1
My family has always wanted me to go to college.	SUP2
If I run into problems concerning school, I have someone who would listen to me and help me.	SUP3
Leadership (LEA)	
I am sometimes looked up to by others.	LEA1
In groups where I am comfortable, I am often looked to as leader.	LEA1
I was a leader in high school.	LEA2
My friends look at me to make decisions.	LEA2
I am not good at getting others to go along with me.*	LEA3
Long Range Goals (LRG)	
I prefer to be spontaneous rather than to make plans.*	LRG1
I usually mark important dates on my calendar.	LRG1
I know what I want to be doing 10 years from now.	LRG2

(Table 1 continued on next page)

Table 1 continued

I have studied things about my major field on my own.	LRG2
I often make lists of things to do.	LRG2
I have talked about my career goals with someone who has worked in that field.	LRG3
I have already learned something in my proposed major outside of high school.	LRG3
Ability to Establish Community Ties (COM)	
I expect to be involved in many off-campus activities while enrolled here.	COM1
I don't expect to get to know faculty personally during my first year.*	COM1
I am comfortable interacting with people from other races or cultures.	COM2
I expect the faculty to treat me differently from the average student here.	COM2
I enjoy working with others.	COM3
I keep to myself pretty much.*	COM3
I find I get more comfortable in a new place as soon as I make some good friends.	COM4
I expect to find lots of people who are like me here.	COM4
Understanding of Racism (RAC)	
I expect to have little contact with students from other races.	RAC1
My friends are exclusively the same race as I am.	RAC1
My background should help me fit in well here.*	RAC2
It should not be very hard to get a B average here.	RAC2
Academic Familiarity (ACF)	
I have studied things about my major field on my own.	ACF1
I have talked about my career goal with someone who works in that career.	ACF1
I have learned more outside of school than in school.	ACF2
Degree of academic relatedness of three current goals.	ACF2

*indicates that the item was reverse coded.

Table 2

Estimates of Internal Consistencies (Alpha) of Each Non-Cognitive Dimension by Sample.

		Sample		
Dimension	n items	Black 1	Black 2	White
Academic Positive Self-Concept	4	.60	.49	.40
Realistic Self Appraisal	5	.58	.56	.49
Support of Academic Plans	3	.84	.53	.49
Leadership	6	.79	.83	.82
Long Range Goals	7	.65	.72	.68
Community Ties	8	.61	.57	.70
Racism	4	.55	.54	.37
Academic Familiarity	5	.66	.74	.60

Table 3

Standardized Parameter Estimates (Lambda X) of the NCQ-R Generated on the First Black Sample.

	Dimension							
Variable	PSC	RSA	SUP	LEA	LRG	COM	RAC	ACF
PSC1	.26							
PSC2	-.92							
RSA1		.47						
RSA2		.42						
RSA3		.47						
SUP1			.30					
SUP2			.37					
SUP3			.26					
LEA1				.49				
LEA2				.56				
LEA3				.30				
LRG1					.19			
LRG2					.41			
LRG3					.87			
COM1						.30		
COM2						-.25		
COM3						.61		
COM4						.19		
RAC1							.36	
RAC2							.51	
ACF1								.82
ACF2								.51

Table 4

Standardized Parameter Estimates of the Relations Among the Eight Non-Cognitive Dimensions (PHI)

	Dimension							
Dimension	PSC	RSA	SUP	LEA	LRG	COM	RAC	ACF
PSC	1.00*							
RSA	-.19	1.00*						
SUP	.20	-.34*	1.00*					
LEA	-.22	.33*	-.22	1.00*				
LRG	-.04	.52*	-.36	.29	1.00*			
COM	-.11	.62*	-.47*	.44*	.49*	1.00*		
RAC	.67*	-.38*	.37*	-.32*	-.17	-.51*	1.00*	
ACF	.02	.42*	-.37*	.26	.15	.51*	-.11	1.00*

*p<.05 based on the ratio of the ratio of parameter of the phi matrix to its standard error.

Table 5

Goodness of Fit Indices for the Comparison of Factor Invariance

	Samples Compared	
Indices	Black 1 vs. Black 2	Black 1 vs. White
Test of Equality of Covariance Matrices		
Maximum likelihood chi-squared	496.97	384.37
Chi-squared/df ratio	1.96	1.52
Goodness of fit of Second Sample Using Model Obtained on First Sample		
Goodness of Fit Index GFI Sample 2	.77	.84
Root Mean Squared Residual RMR Sample 2	.071	.045
Tucker-Lewis Index TLI Sample 2	.72	.73